

Amendments to the claims:

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1. (original) A method for masking a foreground portion of a digital image from a background portion of a digital image, the digital image being part of a video comprising a time sequence of digital images, each image being defined by a plurality of pixels, the method comprising:

receiving a first input defining a first border region, the first border region including at least a part of the foreground portion and at least a part of the background portion in a first digital image;

receiving a second input defining a second border region, the second border region including at least a part of the foreground portion and at least a part of the background portion in a second digital image;

interpolating an intermediary border region for an image intermediary in time to the first and second digital images; and

using the first, second, and intermediary border regions for masking the foreground portion from the background portion in the digital video.

2. (original) The method of claim 1 wherein receiving a first and a second input comprise:

receiving user inputs defining the border regions; and where interpolating an intermediary border region comprises:

interpolating an intermediary border region automatically without user input.

3. (original) The method of claim 1 wherein using the first, second, and intermediary border regions for masking the foreground portion from the background portion comprises:

determining for a pixel in a border region whether it includes data that is associated with the foreground portion; and

using the result of the determining step to mask the foreground portion from the background portion in the digital video.

4. (original) The method of claim 1, further comprising the steps of:  
estimating an intrinsic color value for a pixel in the first, second, and intermediary border regions; and  
using the estimated intrinsic color value for extracting the foreground portion from the background portion.

5. (original) The method of claim 1 wherein receiving inputs indicating the border regions comprises:  
generating an inside path located inside a foreground portion; and  
generating an outside path located outside the foreground portion and enclosing the inside path,  
wherein pixels between the inside and outside paths belong to a border region.

6. (original) The method of claim 5 wherein generating an inside path and an outside path comprise:  
generating a vector-based inside path and a vector-based outside path.

7. (original) The method of claim 2 wherein receiving inputs indicating the border regions comprises:  
generating a single path having a width encompassing that of the border region.

8. (original) The method of claim 7 wherein generating a single path comprises:  
generating a vector-based single path.

9. (original) The method of claim 7 wherein generating a single path comprises:  
generating a single path having variable thickness throughout its length.

10. (original) The method of claim 1 wherein using the first, second, and intermediary border regions for masking the foreground portion from the background portion comprises:  
masking the foreground portion and a portion of the border region; and

applying Gaussian blur to the portion of the border region.

11. (original) The method of claim 10, further comprising displaying the masked foreground portion and the portion of the border region.

12. (original) The method of claim 1 wherein using the first, second, and intermediary border regions for masking the foreground portion from the background portion comprises:  
masking the foreground portion and a portion of the border region;  
determining the opacities of the pixels in the portion of the border region that is displayed with the foreground portion; and  
changing the opacities for pixels having opacities greater than a threshold value.

13. (original) The method of claim 12, further comprising displaying the masked foreground portion and the portion of the border region.

14. (original) The method of claim 1 further comprising:  
receiving an input defining a border region for a second foreground portion in the first digital image, the border region including at least a part of a second foreground portion and at least a part of the background portion;  
receiving an input defining a border region for the second foreground portion in the second digital image, the border region including at least a part of the second foreground portion and at least a part of the background portion; and  
interpolating an intermediary border region for the second foreground portion for an image intermediary to the first and second digital images.

15. (original) The method of claim 1 further comprising:  
receiving an input defining a first internal border region, the first internal border region being enclosed by the first border region, in a first digital image;  
receiving an input defining a second internal border region, the second internal border region being enclosed by the second border region, in a second digital image;

interpolating an intermediary internal border region for an image intermediary in time to the first and second digital images; and

using the first, second, and intermediary border regions, and the first internal, second internal, and intermediary internal border regions for masking the foreground portion from the background portion in the digital video.

16. (original) The method of claim 15, wherein the first internal border region, the second internal border region, and the intermediary internal border region comprise at least a part of the foreground portion.

17. (original) The method of claim 15, wherein the first internal border region, the second internal border region, and the intermediary internal border region comprise at least a part of the background portion.

18. (original) The method of claim 15, wherein the first internal border region, the second internal border region, and the intermediary internal border region comprise at least a part of the foreground portion and at least a part of the background portion.

19. (original) The method of claim 1, wherein the foreground portion is an object.

20. (original) A method for masking a foreground portion of a digital image from a background portion of a digital image, the digital image being part of a video comprising a time sequence of digital images, each image being defined by a plurality of pixels, the method comprising:

receiving an input defining an initial border region, the initial border region including at least a part of the foreground portion and at least a part of the background portion in an initial digital image;

automatically generating a border region for another digital image in the time sequence based on the initial border region; and

using the initial and automatically generated border regions for masking the foreground portion from the background portion in the digital video.

21. (original) The method of claim 20 wherein receiving an input comprises receiving a user input defining the border region.

22. (original) The method of claim 20 wherein using the initial and automatically determined border regions for masking the foreground portion from the background portion comprises:

determining for a pixel in a border region whether it comprises data that is associated with the foreground portion; and

using the result of the determining step to mask the foreground portion from the background portion in the digital video.

23. (original) The method of claim 20 further comprising:  
estimating an intrinsic color value for a pixel in the first, second, and intermediary border regions; and

using the estimated intrinsic color value for extracting the foreground portion from the background portion.

24. (original) The method of claim 21 wherein receiving a user input indicating the border regions comprises:

generating an inside path located inside the foreground portion; and  
generating an outside path located outside the foreground portion and enclosing the inside path, wherein pixels between the inside and outside paths belong to a border region.

25. (original) The method of claim 24 wherein generating an inside path and an outside path comprise:

generating a vector-based inside path and a vector-based outside path.

26. (original) The method of claim 21 wherein receiving a user input indicating the border region comprises:

generating a single path having a width encompassing the border region.

27. (original) The method of claim 26 wherein generating a single path comprises:  
generating a vector-based single path.

28. (original) The method of claim 26 wherein generating a single path comprises:  
generating a single path having a variable thickness throughout its length.

29. (original) The method of claim 20 wherein using the initial and the automatically generated border regions for masking the foreground portion from the background portion comprises:

masking the foreground portion and a portion of the border region; and  
applying Gaussian blur to the portion of the border region.

30. (original) The method of claim 29 further comprising displaying the masked foreground portion and the portion of the border region.

31. (original) The method of claim 20 wherein using the initial and the automatically generated border regions for masking the foreground portion from the background portion comprises:

masking the foreground portion and a portion of the border region;  
determining the opacities of the pixels in the portion of the border region that is displayed with the foreground portion; and  
changing the opacities for pixels having opacities greater than a threshold value.

32. (original) The method of claim 31, further comprising displaying the masked foreground portion and the portion of the border region.

33. (original) The method of claim 20 further comprising:  
receiving an input defining an initial border region for a second foreground portion, the border region including at least a part of a second foreground portion and at least a part of the background portion in the digital image with the first foreground portion;  
automatically generating a border region for the second foreground portion in another image in the time sequence based on the initial border region for the second foreground portion;  
and  
using the initial and automatically generated border regions for masking the second foreground portion from the background portion in the digital video.

34. (original) The method of claim 20 further comprising:  
receiving an input defining an initial internal border region, the initial internal border region being enclosed by the initial border region, in a first digital image;  
automatically generating an internal border region for another image in the time sequence based on the initial internal border region; and  
using the initial internal and the automatically generated internal border regions for masking the foreground portion from the background portion in the digital video.

35. (original) The method of claim 34, wherein the initial internal border region and the automatically generated internal border region comprise at least a part of the foreground portion.

36. (original) The method of claim 34, wherein the initial internal border region and the automatically generated internal border region comprise at least a part of the background portion.

37. (original) The method of claim 34, wherein the initial internal border region and the automatically generated internal border region comprise at least a part of the foreground portion and at least a part of the background portion.

38. (original) The method of claim 20, wherein the foreground portion is an object.

39. (original) The method of claim 20 wherein automatically generating a border region for another digital image comprises:

- identifying an edge path in the initial border region, the edge path indicating edges of the foreground portion in the initial digital image;

- identifying an edge path in an automatically generated border region, the edge path indicating edges of the foreground portion in the another digital image;

- determining an edge path transformation between the initial digital image and the another digital image; and

- applying the edge path transformation to the inside path and the outside path in the initial digital image in order to generate a border region in the another digital image.

40. (original) The method of claim 39 wherein identifying the edge path in the another automatically generated border region comprises:

- identifying the edge path using a snake algorithm operating on a previously identified edge path.

41. (original) The method of claim 39 wherein identifying an edge path in the initial border region comprises:

- finding points in the border region that have image gradient values exceeding a threshold value.

42. (currently amended) The method of claim 41 further comprising ~~the step~~:

- calculating an image gradient value for each color channel in the initial border region.

43. (original) The method of claim 39 wherein identifying an edge path in the initial border region comprises:

- copying the inside path and the outside path;



moving the copies of the inside path and the outside path towards each other and towards edges of the foreground portion using a snake algorithm; and

identifying the edge path as the path where copy of the inside path and the copy of the outside path converge into one path.

44. (original) The method of claim 39 wherein determining an edge path transformation comprises:

determining a set of local edge path transformations, the set of local edge path transformations together forming the edge path transformation.

45. (original) The method of claim 44 wherein determining a set of local edge path transformations comprises:

determining a local edge path transformation for each point in the edge path.

46. (original) The method of claim 44 wherein determining a set of local edge path transformations comprises:

determining a translation, a rotation, and a scaling for each local edge path transformation in the set of local edge path transformations.

47. (original) The method of claim 39 wherein applying the edge path transformation to the inside and outside path comprises:

applying a set of local transformations to each point in the inside path and to each point in the outside path, the set of local transformations forming the edge path transformation.

48. (original) The method of claim 47 wherein applying a set of local transformations comprises:

applying a translation, a rotation, and a scaling as each local transformation of the inside path and the outside path.

49. (original) A method for masking an object from a background in a digital video, the digital video comprising a time sequence of digital images, each image being defined by a plurality of pixels, the method comprising:

- receiving a first user input defining a first border region, the first border region including at least a part of the object and at least a part of the background in a first digital image;

- receiving a second user input defining a second border region, the second border region including at least a part of the object and at least a part of the background portion in a second digital image;

- interpolating an intermediary border region for an image intermediary in time to the first and second digital images;

- using the first, second, and intermediary border regions for masking the object from the background in the digital video;

- using the first, second, and intermediary border regions for extracting the object from the background in the digital video; and

- placing the masked and extracted object against a new background in another digital video.

50. (original) Computer software, tangibly embodied in a computer-readable medium or a propagated carrier signal for masking a foreground portion of a digital image from a background portion of a digital image, the digital image being part of a video comprising a time sequence of digital images, each image being defined by a plurality of pixels, the software comprising instructions to perform the following operations:

- receive a first input defining a first border region, the first border region including at least a part of the foreground portion and at least a part of the background portion in a first digital image;

- receive a second input defining a second border region, the second border region including at least a part of the foreground portion and at least a part of the background portion in a second digital image;

- interpolate an intermediary border region for an image intermediary in time to the first and second digital images; and

use the first, second, and intermediary border regions for masking the foreground portion from the background portion in the digital video.

51. (original) Computer software, tangibly embodied in a computer-readable medium or a propagated carrier signal for masking a foreground portion of a digital image from a background portion of a digital image, the digital image being part of a video comprising a time sequence of digital images, each image being defined by a plurality of pixels, the software comprising instructions to perform the following operations:

receive an input defining an initial border region, the initial border region including at least a part of the foreground portion and at least a part of the background portion in an initial digital image;

automatically generate a border region for another digital image in the time sequence based on the initial border region; and

use the initial and automatically generated border regions for masking the foreground portion from the background portion in the digital video.

52. (new) The computer software of claim 50 wherein the instructions to receive a first and a second input comprise instructions to:

receive user inputs defining the border regions; and where interpolating an intermediary border region comprises:

interpolate an intermediary border region automatically without user input.

53. (new) The computer software of claim 50 wherein the instructions to use the first, second, and intermediary border regions for masking the foreground portion from the background portion comprises instructions to:

determine for a pixel in a border region whether it includes data that is associated with the foreground portion; and

use the result of the determining step to mask the foreground portion from the background portion in the digital video.

54. (new) The computer software of claim 50, further comprising instructions to perform the following operations:

estimate an intrinsic color value for a pixel in the first, second, and intermediary border regions; and

use the estimated intrinsic color value for extracting the foreground portion from the background portion.

55. (new) The computer software of claim 50 wherein the instructions to receive inputs indicating the border regions comprise instructions to:

generate an inside path located inside a foreground portion; and

generate an outside path located outside the foreground portion and enclosing the inside path,

wherein pixels between the inside and outside paths belong to a border region.

56. (new) The computer software of claim 55 wherein the instructions to generate an inside path and an outside path comprise instructions to generate a vector-based inside path and a vector-based outside path.

57. (new) The computer software of claim 52 wherein the instructions to receive inputs indicating the border regions comprise instructions to generate a single path having a width encompassing that of the border region.

58. (new) The computer software of claim 57 wherein the instructions to generate a single path comprise instructions to generate a vector-based single path.

59. (new) The computer software of claim 57 wherein the instructions to generate a single path comprise instructions to generate a single path having variable thickness throughout its length.

60. (new) The computer software of claim 50 wherein the instructions to use the first, second, and intermediary border regions for masking the foreground portion from the background portion comprise instructions to:

- mask the foreground portion and a portion of the border region; and
- apply Gaussian blur to the portion of the border region.

61. (new) The computer software of claim 60, further comprising instructions to display the masked foreground portion and the portion of the border region.

62. (new) The computer software of claim 50 wherein the instructions to use the first, second, and intermediary border regions for masking the foreground portion from the background portion comprise instructions to:

- mask the foreground portion and a portion of the border region;
- determine the opacities of the pixels in the portion of the border region that is displayed with the foreground portion; and
- change the opacities for pixels having opacities greater than a threshold value.

63. (new) The computer software of claim 62, further comprising instructions to display the masked foreground portion and the portion of the border region.

64. (new) The computer software of claim 50 further comprising instructions to perform the following operations:

- receive an input defining a border region for a second foreground portion in the first digital image, the border region including at least a part of a second foreground portion and at least a part of the background portion;

- receive an input defining a border region for the second foreground portion in the second digital image, the border region including at least a part of the second foreground portion and at least a part of the background portion; and

- interpolate an intermediary border region for the second foreground portion for an image intermediary to the first and second digital images.

65. (new) The computer software of claim 50 further comprising instructions to perform the following operations:

receive an input defining a first internal border region, the first internal border region being enclosed by the first border region, in a first digital image;

receive an input defining a second internal border region, the second internal border region being enclosed by the second border region, in a second digital image;

interpolate an intermediary internal border region for an image intermediary in time to the first and second digital images; and

use the first, second, and intermediary border regions, and the first internal, second internal, and intermediary internal border regions for masking the foreground portion from the background portion in the digital video.

66. (new) The computer software of claim 65, wherein the first internal border region, the second internal border region, and the intermediary internal border region comprise at least a part of the foreground portion.

67. (new) The computer software of claim 65, wherein the first internal border region, the second internal border region, and the intermediary internal border region comprise at least a part of the background portion.

68. (new) The computer software of claim 65, wherein the first internal border region, the second internal border region, and the intermediary internal border region comprise at least a part of the foreground portion and at least a part of the background portion.

69. (new) The computer software of claim 50, wherein the foreground portion is an object.

70. (new) The computer software of claim 51 wherein the instructions to receive an input comprise instructions to receive a user input defining the border region.

71. (new) The computer software of claim 51 wherein the instructions to use the initial and automatically determined border regions for masking the foreground portion from the background portion comprise instructions to:

determine for a pixel in a border region whether it comprises data that is associated with the foreground portion; and

use the result of the determining step to mask the foreground portion from the background portion in the digital video.

72. (new) The computer software of claim 51 further comprising instructions to perform the following operations:

estimate an intrinsic color value for a pixel in the first, second, and intermediary border regions; and

use the estimated intrinsic color value for extracting the foreground portion from the background portion.

73. (new) The computer software of claim 70 wherein the instructions to receive a user input indicating the border regions comprise instructions to:

generate an inside path located inside the foreground portion; and

generate an outside path located outside the foreground portion and enclosing the inside path, wherein pixels between the inside and outside paths belong to a border region.

74. (new) The computer software of claim 73 wherein the instructions to generate an inside path and an outside path comprise instructions to generate a vector-based inside path and a vector-based outside path.

75. (new) The computer software of claim 70 wherein the instructions to receive a user input indicating the border region comprise instructions to generate a single path having a width encompassing the border region.

76. (new) The computer software of claim 75 wherein the instructions to generate a single path comprise instructions to generate a vector-based single path.

77. (new) The computer software of claim 75 wherein the instructions to generate a single path comprise instructions to generate a single path having a variable thickness throughout its length.

78. (new) The computer software of claim 51 wherein the instructions to use the initial and the automatically generated border regions for masking the foreground portion from the background portion comprise instructions to:

- mask the foreground portion and a portion of the border region; and
- apply Gaussian blur to the portion of the border region.

79. (new) The computer software of claim 78 further comprising instructions to display the masked foreground portion and the portion of the border region.

80. (new) The computer software of claim 51 wherein the instructions to use the initial and the automatically generated border regions for masking the foreground portion from the background portion comprise instructions to:

- mask the foreground portion and a portion of the border region;
- determine the opacities of the pixels in the portion of the border region that is displayed with the foreground portion; and
- change the opacities for pixels having opacities greater than a threshold value.

81. (new) The computer software of claim 80, further comprising instructions to display the masked foreground portion and the portion of the border region.

82. (new) The computer software of claim 51 further comprising instructions to perform the following operations:



receive an input defining an initial border region for a second foreground portion, the border region including at least a part of a second foreground portion and at least a part of the background portion in the digital image with the first foreground portion;

automatically generate a border region for the second foreground portion in another image in the time sequence based on the initial border region for the second foreground portion; and

use the initial and automatically generated border regions for masking the second foreground portion from the background portion in the digital video.

83. (new) The computer software of claim 51 further comprising instructions to perform the following operations:

receive an input defining an initial internal border region, the initial internal border region being enclosed by the initial border region, in a first digital image;

automatically generate an internal border region for another image in the time sequence based on the initial internal border region; and

use the initial internal and the automatically generated internal border regions for masking the foreground portion from the background portion in the digital video.

84. (new) The computer software of claim 83, wherein the initial internal border region and the automatically generated internal border region comprise at least a part of the foreground portion.

85. (new) The computer software of claim 83, wherein the initial internal border region and the automatically generated internal border region comprise at least a part of the background portion.

86. (new) The computer software of claim 83, wherein the initial internal border region and the automatically generated internal border region comprise at least a part of the foreground portion and at least a part of the background portion.

87. (new) The computer software of claim 51, wherein the foreground portion is an object.

88. (new) The computer software of claim 51 wherein the instructions to automatically generate a border region for another digital image comprise instructions to:

identify an edge path in the initial border region, the edge path indicating edges of the foreground portion in the initial digital image;

identify an edge path in an automatically generated border region, the edge path indicating edges of the foreground portion in the another digital image;

determine an edge path transformation between the initial digital image and the another digital image; and

apply the edge path transformation to the inside path and the outside path in the initial digital image in order to generate a border region in the another digital image.

89. (new) The computer software of claim 88 wherein the instructions to identify the edge path in the another automatically generated border region comprise instructions to:

identify the edge path using a snake algorithm operating on a previously identified edge path.

90. (new) The computer software of claim 88 wherein the instructions to identify an edge path in the initial border region comprise instructions to:

find points in the border region that have image gradient values exceeding a threshold value.

91. (new) The computer software of claim 90 further comprising instructions to calculate an image gradient value for each color channel in the initial border region.

92. (new) The computer software of claim 88 wherein the instructions to identify an edge path in the initial border region comprise instructions to:

copy the inside path and the outside path;

move the copies of the inside path and the outside path towards each other and towards edges of the foreground portion using a snake algorithm; and

identify the edge path as the path where copy of the inside path and the copy of the outside path converge into one path.

93. (new) The computer software of claim 88 wherein the instructions to determine an edge path transformation comprise instructions to:

determine a set of local edge path transformations, the set of local edge path transformations together forming the edge path transformation.

94. (new) The computer software of claim 93 wherein the instructions to determine a set of local edge path transformations comprise instructions to determine a local edge path transformation for each point in the edge path.

95. (new) The computer software of claim 93 wherein the instructions to determine a set of local edge path transformations comprise instructions to determine a translation, a rotation, and a scaling for each local edge path transformation in the set of local edge path transformations.

96. (new) The computer software of claim 88 wherein the instructions to apply the edge path transformation to the inside and outside path comprise instructions to apply a set of local transformations to each point in the inside path and to each point in the outside path, the set of local transformations forming the edge path transformation.

97. (new) The computer software of claim 96 wherein the instructions to apply a set of local transformations comprise instructions to apply a translation, a rotation, and a scaling as each local transformation of the inside path and the outside path.

98. (new) Computer software, tangibly embodied in a computer-readable medium or a propagated carrier signal for masking an object from a background in a digital video, the digital

video comprising a time sequence of digital images, each image being defined by a plurality of pixels, the software comprising instructions to perform the following operations:

- receive a first user input defining a first border region, the first border region including at least a part of the object and at least a part of the background in a first digital image;

- receive a second user input defining a second border region, the second border region including at least a part of the object and at least a part of the background portion in a second digital image;

- interpolate an intermediary border region for an image intermediary in time to the first and second digital images;

- use the first, second, and intermediary border regions for masking the object from the background in the digital video;

- use the first, second, and intermediary border regions for extracting the object from the background in the digital video; and

- place the masked and extracted object against a new background in another digital video.